Things you should know from 12.4, 5, 6:

12.4

- What makes a curve C traced out by a vector-valued function $\mathbf{r}(t)$ smooth (two conditions on $\mathbf{r}'(t)$)? Piecewise smooth?
- For the purposes of this course, a curve is either smooth or piecewise smooth[1].
- What makes a curve closed?
- How do you compute the length of a curve C traced out by a vector-valued function $\mathbf{r}'(t)$ over a time interval $a \leq t \leq b$?
- How do you compute the arclength of a curve starting from some time point $t = a$?
- What is $\sqrt{x^2}$. Hint: the answer is **not** x.

12.5

- What is the tangent vector $\mathbf{T}(t)$ to some vector-valued function $\mathbf{r}(t)$?
- What is the normal vector $\mathbf{N}(t)$ to some vector-valued function $\mathbf{r}(t)$? Why is it normal to $\mathbf{T}(t)$?
- What are the magnitudes of $\mathbf{T}(t)$ and $\mathbf{N}(t)$?
- What do $\mathbf{T}(t)$ and $\mathbf{N}(t)$ mean geometrically with respect to the curve C traced out by a vector-valued function $\mathbf{r}(t)$?
- What is the binormal vector $\mathbf{B}(t)$?
- What are the magnitudes of the components of the acceleration $\mathbf{a}(t)$ in the direction of $\mathbf{T}(t)$ (a_T) and $\mathbf{N}(t)$ (a_N)? There are multiple forms for these. Use whichever is easiest.

12.6

- What is the curvature $\kappa(t)$ of a curve C traced out by the vector-valued function $\mathbf{r}(t)$? There are two useful forms for this, depending on if you prefer using the quotient rule for derivatives or computing cross products.
- What is the radius of curvature $\rho(t)$ for some curve C? Why does it have 'radius' in its name? (Hint: the answer involves circles).
- What is the curvature of a line ℓ?

[1] For the purposes of reality, see the Weierstrass function for an example of a curve that is neither smooth nor piecewise smooth: `http://en.wikipedia.org/wiki/Weierstrass_function`. In fact, the Weierstrass curve is everywhere continuous but nowhere differentiable. Weird, right?